REMARKS/ARGUMENTS

Claims 1-10 and 12-21 are presently pending, and all stand rejected. Each of the claims 1-9 includes the limitation of a "constant current charging module" or the corresponding step of charging a firing energy storage module "wherein current to said firing energy storage module is limited to a constant current." All claims but 18, 19, and 21 stand rejected as obvious over U.S. Patent No. 5,460,093 to Prinz et al. ("Prinz") in view of U.S. Patent No. 3,752,081 to McKeown et al. ("McKeown"). Claim 19 stands rejected as anticipated by McKeown, and claims 18 and 21 stand rejected as obvious over the combination of Prinz and McKeown in view of further references.

1. The Finality of the Action Was Premature

The rejection in the first (December 18, 2003) action of claim 19 as anticipated by Prinz was withdrawn and replaced with a completely new rejection in the present (July 20, 2004) action of claim 19 as anticipated by McKeown. This new grounds of rejection was not made in response to an amendment of claim 19, which remains in its original form. Consequently, imposition of a final rejection was improper under MPEP 706.07(a), which precludes a final rejection on second action when "the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims nor based on information submitted in an [IDS]." The Examiner is therefore respectfully requested to withdraw the finality of the present action.

2. Claim 19 Is Not Anticipated by McKeown

McKeown discloses a "constant current source" (col. 5, lines 25-39), not a "constant current charging module" as claimed in claim 19. (Declaration of Gimlong Teowee dated October 19, 2004, ¶4 ("Teowee Decl.")). Even if other circuitry

in the McKeown blasting machine is considered (e.g., those elements shown within power supply 1), there is not the slightest disclosure - express or inherent - to indicate that the components together provide a constant current **charging** of the blasting machine's storage capacitor 153. (Id.) (In fact, it appears impossible that the disclosed circuitry could result in such charging). (Id.)

Moreover, the constant current source disclosed in McKeown is for use in a blasting machine, and is not "for use in an electronic detonator" as claimed in claim 19. (Id.) The two different applications would necessitate substantial, material, structural differences. (Id.)

3. The Remaining Claims Are Not Obvious

The rejections assert that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify a detonator such as that taught by Prinz to include a "constant current source" as mentioned in McKeown at col. 5, line 25. To the contrary, it would not have been obvious to make such a combination.

a. The asserted motivation to combine is irrelevant to the pyrotechnic device and method of charging same.

The Office Action (at pages 2-3) supports the propriety of combining Prinz and McKeown as stated with an assertion that the "suggestion/motivation for doing so would have been to charge a capacitor to 200 joules within 10 seconds and to 400 joules within 20 seconds."

Such a suggestion/motivation is untenable because - while certainly relevant to a **blasting machine** - it is certainly irrelevant to the pyrotechnic devices such as taught by Prinz that are *operated by* a blasting machine. (Teowee Decl., ¶5). Indeed, 200 or 400 joules is many orders of magnitude higher

than the capacitor in a pyrotechnic device such as is taught in Prinz is charged. (Id.) The preferred firing capacitor in Prinz is 60-80μF and charged to 22V (col. 7, lines 1-34), and the firing capacitor disclosed as preferred in the present application is 47-374μF charged to 25V. (Id.) Such capacitors thus charged therefore have no more than a 117mJ charge. (Id.)

In fact, modifying the teachings of Prinz to include a constant current source (or even a charging module) for the stated motivation of charging a capacitor to 200 or 400 joules could never result in a workable device. (Id.) A firing capacitor charged to 200 or 400 joules could not safely be placed in a pyrotechnic device such as the type taught by Prinz. (Id.)

In summary, the cited "suggestion/ motivation ... to charge a capacitor to 200 joules within 10 seconds and to 400 joules within 20 seconds" is a motivation that applies only to a blasting machine - not the pyrotechnic device or method of charging same. There is no reason to charge a capacitor in such a device to 200 or 400 joules in *any* period of time. (Id.)

b. Even viewed more broadly than stated by the Examiner, McKeown's suggestion/motivation is still irrelevant

Even considering the motivation for using the optional constant current source in McKeown more broadly than articulated by the Examiner, it is still irrelevant.. The sole suggestion/ motivation to be divined in McKeown for its optional use of a constant current source is to ameliorate the effects of **battery deterioration**:

> Since batteries deteriorate with use, they are capable of achieving the initial charged energy [of 200 joules within 10 seconds and 400 joules within 20 seconds], but tests reveal that when they are used to charge the capacitor 153 to 400 joules three times a day for 21 days, it would take a maximum of 71 seconds of charge time to obtain 400 joules of energy at the capacitor 153.

[Col. 5, lines 30-36].

> [W]hen a constant current source having an output voltage of about 10 volts is used in lieu of the battery 140 ... the capacitor 153 can be charged to 200 joules within 10 seconds and to 400 joules within 20 seconds.

[Col. 5, lines 25-30].

But this suggestion/motivation to ameliorate battery deterioration effects is inapposite to the context of the pyrotechnic devices and manner of charging them as in Prinz and as claimed. (Teowee Decl., ¶6).

First, there was no motivation to put a constant current source in each of the pyrotechnic devices for the purpose of ameliorating deterioration of the *blasting machine's battery*, because one of ordinary skill in the art would have readily recognized that the battery deterioration problem must be fully addressed within the blaster itself (e.g., with a constant current source as optionally disclosed in McKeown). (Id.) For one thing, the system would otherwise have to operate on unpredictable, varying voltages supplied to the bus by the blasting machine, which is not practical. (Id.) Further, one of ordinary skill in the art would certainly desire not to add more complexity and circuits to pyrotechnic devices as taught in Prinz if the issue could be addressed centrally in the blasting machine. (Id.)

Second, there was no motivation to put a constant current source in each of the pyrotechnic devices for the purpose of ameliorating deterioration of the *pyrotechnic device's firing energy storage module*. (Teowee Decl., ¶7). Prinz discloses a firing *capacitor*, but even if the firing energy storage module were a *battery*, there would be no motivation to modify it to be a constant current source within the pyrotechnic device. (Id.) This is because the deterioration of a firing storage energy battery in such a device would likely be too insignificant over

its rated operating life to warrant adding any circuitry in the pyrotechnic device to address it, and even if the deterioration were desired to be addressed with circuitry within the pyrotechnic device, one of ordinary skill in the art would use voltage regulating - not constant current - circuitry to rectify the battery's output. (Id.) Likewise, even if its firing energy storage module were a battery, there would also be no motivation to modify a pyrotechnic device such as taught by Prinz to permit *charging of* that battery with a constant current source within the pyrotechnic device, because any charge-topping required in such a battery would be too negligible. (Id.)

Third, in the case of claims 1-9 and 13-18, which are each limited to a firing energy storage module that is a **capacitor,** the broad motivation of ameliorating the effects of battery deterioration is completely irrelevant because there is no battery. (Teowee Decl., ¶8). One of ordinary skill in the art would have recognized that a capacitor does not suffer battery deterioration, and in fact does not suffer *any* deterioration in output that is significant enough in the context of such a pyrotechnic device to warrant adding circuitry to ameliorate the effects of deterioration. (Id.)

c. The claimed invention is not obvious

As discovered by Applicant, the use of constant current charging of an igniter firing energy storage device results in benefits that would not have reasonably been foreseen except with hindsight based on knowledge of the invention itself. As explained in paragraph 7 of Dr. Teowee's March 16, 2004 declaration with reference to the example of an electronic blasting system (such as that of Prinz):

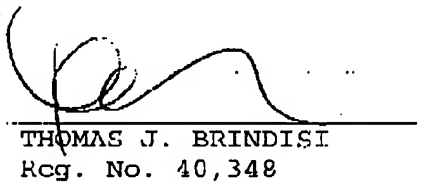
> [A]dding the circuitry required to attain constant-current charging permits desirable reductions in sagging of the bus and potentially damaging surge to the firing capacitors, yet it does not introduce potentially unsafe

conditions in order to do so (as can be the case with automatic charging up of firing capacitors upon powering up of the bus as in prior art). This solution was certainly not obvious at the time of the invention, and variations of it can also make possible a number of other advantages that would not have been anticipated. Such potential advantages are elucidated, for example, in paragraph 3 of this application discussing enhanced bus line monitoring and avoidance and/or reduction of malfunctions relating to shorted or defective capacitors and/or ignition elements, paragraphs 3 and 62 discussing simplified capacitor diagnostics, and paragraphs 59-60 regarding staggered charging of a potentially large number of detonators on the system.

CONCLUSION

Withdraw of finality of the second action, and favorable action on this application, is thus respectfully requested in view of the foregoing arguments and evidence.

Respectfully submitted,



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